Cost Analysis:
A Meat Processing Facility in Western Massachusetts

prepared for

Board of Directors, Open Field Foundation
and
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by

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- *Hudson Valley Meat Processing Facility: Feasibility Study* (Cornell University Animal Sciences Department, from website, n.d. (1999?));
- Dan Nudell and Tim Perry, *Feasibility of Operating a Lamb Slaughter Plan in North Dakota: A Report to Valley Wool Growers* (North Dakota State University, 1997), and
- Roger Clapp, *Northeast Livestock Project Market & Supply Study: Final Report* (2001).

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The following websites relevant to meat processing for small New England producers were also helpful:

Regulations
<www.fsis.usda.gov> USDA Food Safety and Inspection Service
<vm.cfsan.fda.gov> Center for Food Safety & Applied Nutrition
<www.foodsafety.gov> Gateway to Government Food Safety Information
Buildings
<www.denisgrp.com> The Dennis Group
Equipment
<www.cryovac.com> Cryovac (division of Sealed Air Corporation)
<www.kochequipment.com> Koch Equipment
<www.butcher-packer.com> Butcher & Packer Supply Co.
Meat cutting
<www.neculinary.com> New England Culinary Institute
Lamb marketing
<www.kelmscott.org/farmanimals/NewSARE.html> Kelmscott Farm
<www.sheep.cornell.edu> Cornell University Sheep Program
<www.sheepgoatmarketing.org> Northeast Sheep and Goat Marketing Program
<ag.ansc.purdue.edu/sheep> Sheep @ Purdue

EXECUTIVE SUMMARY

It is proposed to develop a meat processing facility in western Massachusetts to produce a variety of value-added products from "primals" (whole, half and quarter carcasses). The facility will likely be used by Bramble Hill Farm in Amherst and perhaps by other meat producers. Its products would be sold through restaurant and retail channels. Ideally it would also include a retail space. Based on known likely demand for the service, the minimum useful capacity is estimated at 100 lamb carcasses per week, or 5,000 per year. The purpose of this report is to analyze the likely development, capital and operating overhead costs of such a facility to support a decision whether or not to pursue it further.

The total costs are estimated to be in the vicinity $340,000, broken down as follows: $208,000 for a new building, $97,000 for equipment, $18,000 for other startup costs, and $20,000 for a year of operating overhead. This assumes no debt and does not include any direct labor or any other variable expense. Financial statements are presented in **Appendix A**.

A rough analysis shows that the direct costs of making sausage from already-paid-for trim would be about 20 cents per pound less than the cost of outsourcing. All of this savings is attributable to vacuum packaging. The savings on processing 5,000 lambs a year would be $200,000 to $250,000 per year. This amount of "revenue" is in proportion to industry standard financial ratios for operating overhead. However, the projected investment in building and equipment is much higher compared to revenue than for the industry overall. This is partly because everything will be new, but it may also be possible to reduce these projected costs.

Equipment investment will be primarily in refrigeration and meat processing equipment. A few key items make up more than half the total amount. Sausage-making will require a mixer-grinder and a sausage stuffer costing about $17,000 to $18,000 total. Packaging for retail will require a vacuum packager costing about $16,000 to $17,000. Hanging large numbers of carcasses in a walk-in cooler will require a rail system, which could cost as much as $25,000.

Regulatory requirements increase both capital investment and operating expenses. However, most of these costs clearly promote sanitation and producing a high-quality product, and common sense would require them anyway. The proposed facility would be subject to Federal inspection, requiring, among other things, a work area with fully washable floors, ceilings and walls. Operations must be conducted in accordance with, among other things, documented and approved Hazard Assessment and Critical Control Point plans and Sanitary Standard Operating Procedures developed by the facility managers to suit its specific products and processes.

Good staff training is necessary to produce a sanitary, high-quality product with good market appeal. Due to changes in the industry, very few meat-cutting schools remain. There are, however, a few opportunities for education in New England and elsewhere. In the short term it will be possible to hire trained part-time meat cutters locally.

Overall, the project is feasible and its economics, while not compelling, are acceptable.

OPERATING REQUIREMENTS

The facility will include space and equipment for cutting, packing, freezing and storing meat and also for making sausage, prepared meals, and other value-added products. The facility may also include a retail sales area. Slaughtering will not be part of the process, but will be outsourced to one of the several slaughterhouses in the region. The facility will have a capacity of at least 100 lamb carcasses a week (of which approximately 20 to 50 would come from Bramble Hill Farm), and it is anticipated that cattle and hog carcasses may be processed as well.

Different processes will require different facilities; for example, break-cutting from primals will require more skilled labor and less equipment than sausage-making. A lamb-only operation will require fewer and simpler resources than processing lambs, cattle and hogs. On-site retail and packaged prepared foods will require additional space and equipment and different skills.

The operation could develop gradually in stages. There are two obvious paths. One is to focus on rapidly developing high-volume meat-processing competencies to supply retailers and restaurants: first break-cutting from primals and packaged sausage, then packaged kebabs, then other packaged or cooked products. In this model, on-site retail would probably be added around the same time as kebabs. The facility would qualify for Federal inspection from the start.

Another possibility is to begin by processing only for on-site retail in relatively small volume. Packaged sausage, packaged kebabs, and break-cutting for retailers and restaurants would be added later. This model would require only local inspection at startup and would allow gradual development of meat-processing skills. It could operate in a smaller building at first and would also require significantly less equipment investment at startup.

Whichever model is preferred, either one will, if successful, permit full development (and require full investment) within the first year or so. Therefore, both for simplicity's sake and to make a conservative financial projection, this report assumes that all equipment is in place at the beginning and that sufficient space for all activities is included in the original building design. However, if the project goes forward, there may be opportunities to reduce start-up costs by dividing it into stages.

It is assumed that, at first, only lamb will be processed, with other species to be added in the future. For the minimum size operation, this report assumes a physical capacity to fully process 100 lamb carcasses per week, although the original usage will be about 20 per week. There should be additional room on site to expand refrigeration and to add space for cooking and other processing equipment when the time is right.

Overall

The minimum overhead staff required is enough management to keep the building secure and functional, a trained person to be responsible for HACCP plans and the sanitary SOP[1], and a trained meat cutter on call.

The minimum building size is about 1,600 to 2,000 square feet with room on site for future expansion, easily sanitized and with sufficient refrigeration, as discussed further below. The work space needed depends on the amount of equipment, the number of people working at once (probably between 2 and 4), and the size of the equipment. The smaller the workroom, the better, as it must be kept cool, around 50°F. Based on workrooms in similar facilities, a room 24 feet by 30 feet (720 square feet) should be large enough. It probably cannot be much smaller than 20 feet by 20 feet (400 square feet).

A critical piece of equipment is a vacuum packager, with other items needed for various processes as described below. A three-bay sink is necessary and a dishwashing machine highly desirable. At least one cutting table and several carts and rolling racks will also be used in all processes.

Cuts from primals

Lamb can arrive from the slaughterhouse as whole carcasses, half-carcasses, or quarters. This report assumes that the primal cut will be the half-carcass. A half carcass, weighing about 30 pounds, is relatively easy to handle, so

[1] These acronyms are explained in the "regulatory" section.

there is no advantage to getting quarters. Because lambs are small, breakcutting a half-carcass can be done entirely by hand. Whole carcasses need to be cut in half with a bandsaw. This not only requires additional equipment, space, and labor, but is also one of the more inherently dangerous operations, best done at the slaughterhouse.

The equipment required is simple: cutting tables, hand tools (knives, saws, boning hooks), scales, carts, and packaging equipment to wrap for fresh delivery. Frozen product will require vacuum packaging.

For labor, good meat cutting skills are a must. Many of the cuts (e.g., racks of lamb) are very high-priced premium cuts requiring excellent eye appeal and minimum waste.

Sausage

The special equipment needed is a meat grinder/mixer and a sausage stuffer. The basic machinery needs to have sufficient capacity to process batches of at least 250 pounds and will probably, based on the existing market demand, be used to process 500-pound batches. In addition, it might be useful to have a small grinder and small stuffer available to make small batches for testing recipes or to use up small lots of meat to avoid commingling with other lots. After the sausage has been made and frozen, it will be vacuum-packed.

For labor, some training is required, but sausage making is a repetitive task in which machines do most of the work. Once the original staff has been trained, on-the-job training should suffice for routine operations. Because of all the grinding and mixing, the staff must be particularly competent respecting food hazards and sanitation requirements. Based on practices at other small processors, it will probably require three people a full day to completely process a 500-pound batch, so it will be necessary to have at least three people, at least one of whom should be an expert in the process.

Kebabs

Kebabs are not currently produced for packaged retail sales but it is believed that there is a good market for the product at higher margins than for sausages. Therefore kebab making will probably be added to the process quite early. It is a relatively simple process: cube the meat by hand, marinate it in covered containers in the refrigerator overnight, and vacuum-pack it.

Except for the vacuum packager, equipment needs are minimal: knives, tables, and containers. Nothing special is needed except pitchers, ladles, colanders, etc., to mix and store the marinade and to drain most of the marinade off the meat before packaging.

Training is simpler than for sausage. Because there is no grinding and the meat will be marinated, the hazards are more easily dealt with. The main skill requirements are to cube the meat by hand and eye, to make the marinade, and to marinate for the correct amount of time.

On-site retail

The processing facility might possibly be on the premises of Bramble Hill Farm, but it might be located elsewhere, for example, in an industrial park. A retail operation could be located at the Farm or at an off-farm processing facility. The advantage of having the retail operation and processing located together is that there will be no duplication of equipment and workspace and the cost will be less. On the other hand, there might be marketing advantages to selling direct from the Farm. Obviously having retail and processing both located on the Farm would sidestep this problem. For the purposes of this report, it is assumed that retail and processing will be located in the same building.

Some small regional processors just have some frozen inventory in a set of glass-door reach-ins. Some even have an honor system for paying. If fresh meat is to be sold, a refrigerated deli case, scales, and wrapping equipment will be needed.

Depending on the type of retail operation undertaken, the labor requirement might be as minimal as collecting the money and restocking the freezers once a day. Selling fresh-cut meat will require someone with excellent customer service skills, sales skills, and a certain amount of showmanship, as well as meat-cutting and money-handling skills.

Cooked product

Cooked product will definitely require different processes and a substantial amount of new equipment, including additional refrigeration to quickly chill the product after cooking to avoid the growth of pathogens. It will also require a different room to prevent cross-contamination from raw to cooked and to avoid heating up the cutting room. Generally, too, cooked packaged foods present more complicated food safety issues and more regulations apply.

Since everything depends on the exact choice of product, this report does not address equipment or training needs in any detail. It is merely recommended that the chosen site have enough space to permit later expansion of the building by at least 500-600 square feet with convenient access to coolers, freezers, and loading areas.

REGULATORY REQUIREMENTS

The regulatory requirements for meat processing are somewhat complex and require serious attention. However, they are not burdensome. They mostly involve establishing and documenting the necessary processes to ensure a safe, unadulterated product. Unlike the command-and-control, rule-book inspection regime in force before the mid-1990's, regulation is now based on performance standards for the exact products and processes under consideration. Processors develop their own procedures and submit them to the inspector. This requires more thought and planning but is more flexible.

The performance standards for the building are quite high with respect to sanitation. This requires a relatively expensive building but the high standards generally incorporate common-sense requirements. Details are discussed below in the "plant and equipment" section.

Federal Inspection

In order to package meat for off-premises sale, it is necessary for the facility to be inspected by the USDA's Food Safety and Inspection Service (FSIS).[2] Massachusetts inspectors work out of the USDA District Office in Albany, NY. Inspections are carried out at no charge to the establishment unless it is necessary for the inspector to work overtime, in which case the establishment pays for the overtime.

To obtain federal inspection, one applies to the FSIS for a "grant of inspection" to become a numbered "official establishment." There is no application fee. The applicant specifies meat, poultry or both and the planned activities (in this case: breakcutting, boning, fabricating, curing and formulating). The establishment premises must be described in a diagram, a written narrative, or a schematic. Responsible persons must be listed on the application. The applicant must disclose convictions of a federal or state felonies or food-related crimes other than felonies.

To receive a grant of inspection, the establishment must:
1. develop and implement a HACCP plan;
2. develop, implement and maintain Sanitation Standard Operating Procedures;
3. conduct generic E. coli testing;
4. comply with Salmonella performance standard requirements;
5. maintain sanitary conditions; and
6. not be unfit to engage in any business requiring inspection.

In addition, the establishment will require a pest management plan, power machinery should meet OSHA standards, and the inspector will require office and locker space. FSIS can suspend or withdraw inspection services if the establishment fails to meet the standards above, fails to destroy condemned product, or assaults, threatens, intimidates or interferes with an FSIS inspector.[3]

FSIS does not pre-approve blueprints or other aspects of the establishment. The applicant is responsible for complying with the regulations, with many details at the case-by-case professional discretion of the Circuit Supervisor. It is advisable to confer with the Circuit Supervisor during planning, but he will not act as a consultant. When the project is under way, the applicant should prepare a draft of the application form and fax it to the Albany office. FSIS then starts a file and assigns an establishment number. The applicant usually has labels printed up once the number has been assigned. Once the facility has been built and the HACCP plans, etc. are finished, the official completed application form is sent in and the Circuit Supervisor does a preliminary inspection including a review of all the plans. He has a checklist he works from but approval is at his discretion and he may require changes. He might make recommendations about staffing. After his approval, the grant of inspection is conditional for 90 days.

A copy of the application for grant of inspection and the text of 9 CFR 500, the section dealing with inspection

[2] There are some exceptions to the Federal inspection requirement, but they are not helpful to the proposed facility. State inspection is theoretically available for plants which distribute only within a particular state, but they are still required to meet or exceed Federal standards. Processors that sell only at their own site (e.g., retail stores, restaurants) are exempt, as is "custom processing" where the meat is for the personal use of the people who owns the animal.

[3] FSIS, Rules of Practice, Final rule effective January 25, 2000: 9 CFR 304, 305, 327, 335, 381, and 500

requirements, is presented in **Appendix B**.

HACCP

A Hazard Assessment and Critical Control Point (HACCP) plan is based on 9 CFR 417. A HACCP plan identifies the hazards in a particular process and devises methods to eliminate those hazards by monitoring critical points in the process. The plan is dated and signed by the responsible person at initial acceptance and upon modification. At least once a year it is reassessed and dated and signed again.

Different species of animal, processes, and products present different hazards and require different controls. Each establishment identifies the hazards for each class of product and creates a HACCP plan for each class. A given establishment might have several HACCP plans. For example, pork and lamb sausages and lamb kebabs would be three classes of product requiring three HACCP plans; raw lamb sausages and cooked lamb sausages would be two classes; lamb sausage links and patties might be a single class.

Certain points in the process are identified at which meeting particular standards will eliminate hazards. These points are periodically monitored and the results recorded. Raw materials and outgoing product are labeled by lot. Each lot's progress through the process is recorded. If monitoring shows that the process is outside the specified range corrective action is taken to restore the process within limits and to deal appropriately with any compromised product.

For example, a HACCP plan might use freezing at 10 degrees Fahrenheit to eliminate a particular hazard. The freezer thermostat might be set to zero and the temperature recorded every 12 hours. If the temperature were found to exceed 10 degrees, the cause would be identified and corrected. The affected lots might be re-processed (for example, cooked) or discarded.

Though each HACCP plan is custom-designed, plans for similar products are naturally very similar and it is therefore possible to use a generic plan as a starting point. Simple, short processes that allow lots to remain distinct lend themselves to the simplest HACCP plans and the least documentation. For the purposes of this report, we will assume that the proposed facility will process only sheep, goats and cattle. If hogs are added to the mix, the plan and facility will need to be designed to avoid cross-contamination with trichina. Poultry processing is not part of the proposed facility, but if it were to be added there would be need of an additional set of processes to deal with poultry's distinctive hazards.

The processing facility's HACCP plan would specify that all animals would be slaughtered at Federally inspected plants, and its plan would begin where the slaughterhouse's ends.

The HACCP plan should be developed with significant involvement by an internal HACCP team. This ensures that the process is thoroughly understood before the plan is developed and also promotes staff "buy-in" to the plan. The regulations specify that a trained person must prepare the final plan:

> "417.7 Training
> "(a) Only an individual who has met the requirements of paragraph (b) of this section, but who need not be an employee of the establishment, shall be permitted to perform the following functions:
> (1) Development of the HACCP plan, in accordance with Sec. 417.2(b) of this part, which could include adapting a generic model that is appropriate for the specific product; and
> (2) Reassessment and modification of the HACCP plan, in accordance with Sec. 417.3 of this part.
> "(b)The individual performing the functions listed in paragraph (a) of this section shall have successfully completed a course of instruction in the application of the seven HACCP principles to meat or poultry product processing, including a segment on the development of a HACCP plan for a specific product and on record review."

Source material for HACCP regulations is contained in a volume of supplementary material. Its table of contents appears in **Appendix C**. A flow chart of a possible sausage-making process and a hypothetical HACCP plan are presented in **Appendix D**.

Sanitation

Federally inspected facilities need a written Sanitary Standard Operating Procedure (SSOP) in accordance with 9 CR Part 416:

> "Each official establishment shall develop, implement, and maintain written standard operating procedures for sanitation ... [which] shall describe all procedures an official establishment will conduct daily, before and during operations, sufficient to prevent direct contamination or adulteration of product(s).[4]"

The SSOP must be signed and dated by a responsible person, must identify pre-operation procedures which shall at minimum address cleaning of food contact surfaces, and shall specify the frequency of each procedure and identify the responsible employee. The SSOP must be implemented as written, it must be routinely evaluated for effectiveness and updated as necessary, deviations from the SSOP must be corrected, and records must be maintained. Like HACCP plans, SSOPs are custom-designed for each operation, but all SSOPs address similar issues. Although microbiological sampling is not required as part of an SSOP, it is commonly incorporated as a way to track effectiveness.

A pest management program should be developed along with the SSOP.

The text of 9 CFR 416.1-6 and 416.11-17 are included in **Appendix E**.

Pathogens

Federal inspection regulations require establishments to conduct generic E. coli testing and to comply with Salmonella performance standards. However, according to a telephone call to the FSIS Technical Center[5] there are, at present, no microbiological sampling requirement for processing lamb carcasses which have already been marked with a Federal inspection seal into raw product, nor any microbiological performance standards for ground lamb.

This situation is specific to raw lamb only. There are existing specific performance standards for ground beef, pork and poultry. Any "ready-to-eat" product would require testing for a variety of pathogens. Slaughter, of course, requires extensive pathogen monitoring. Therefore, any expansion of product or process beyond the limits of raw lamb from Federally-inspected carcasses would require pathogen control. It is also possible that performance standards or testing requirements might be instituted for lamb in the future.

OSHA

FSIS will not inspect powered equipment capable of causing injury (for example, a mixer/grinder or sausage stuffer) unless it can be "locked out" during cleaning and inspection, that is, positively prevented from being energized, in accordance with OSHA regulations.[6] The floor plan should show which equipment this applies to and staff should be trained in how to lock it out. A written agreement each January is required between the establishment and FSIS.

The OSHA regulation is directed mostly at machines hardwired, powered hydraulically or which store potential energy in springs, flywheels, pistons, etc. "Cord-and-plug connected electric equipment is not required to comply with OSHA lockout/tagout procedures."[7] Training needs are minimal. In addition, a durable and legible sign should be posted on each applicable item with wording such as: "DANGER: Always unplug equipment before cleaning, maintenance or inspection.[8]" A draft agreement with FSIS, greatly condensed from the text suggested in the regulation, appears in **Appendix F**. Copies of the agreement should be reviewed with employees during training.

There will probably be a need for other health and safety precautions: ramps around equipment with high hopper openings; good floor protection (e.g., rubber mats); appropriate footwear, eye protection, ergonomic hand tools, etc.

Inspector's facilities

USAD regulations require that the inspector be provided with office space for his/her exclusive use with a desk, a

[4] 9 CFR 416.11-12
[5] September 24, 2001; (800) 233-3935
[6] 29 CFR Part 1910.147 "The Control of Hazardous Energy (Lockout/Tagout)"
[7] FSIS Directive 4791.11, Revision 1 (6/2/97), Section XI-A
[8] This is the writer's recommendation, not, so far as he knows, a regulatory requirement.

locker or closet for clothes, lockable filing cabinet and a phone line. In some cases the government will install a dedicated line for the inspector's laptop computer, but otherwise a telephone on the desk for local calls and toll-free numbers is enough. There needs to be a door for privacy. Seventy square feet is the standard minimum amount but in some cases 60 sf might be acceptable.

Good Manufacturing Practices

Federal law requires "good manufacturing practices" for human food products. These practices apply to all foods, raw or processed, but generally deal with issues pertaining to contamination or spoilage of canned or packaged foods. For purposes of FSIS meat inspection, the term "good manufacturing practices" is not used by itself, but applicable practices should be incorporated into the HACCP plan and SSOP as appropriate. The text of the regulation, 21 CFR 110, appears in **Appendix G**.

TRAINING

The competencies needed are primal breakcutting and boning, sausage making, marinating, packaging, skills with machinery, equipment routine maintenance, and HACCP/SSOP development, implementation and monitoring. Customer-service and money-handling skills are necessary for retail.

As discussed above, good meat cutting skills are absolutely necessary for the high-priced premium cuts. In the short term, trained meat cutters are available on a casual or independent-contractor basis from local restaurants and markets. In the longer term, it would be desirable to train a permanent employee, either from existing staff or after recruitment. By doing its own training, the facility will have greater control over standards and procedures than if it uses people who have developed skills elsewhere.

Because meat nowadays is usually shipped from processor to retailer pre-cut in boxes, rather than in primal form, very few meat cutting schools remain. However, there are several options available.

The New England Culinary Institute in Montpelier, VT has expertise in meat processing from primals and offers a variety of educational options. NECI routinely offers corporate training and can develop customized training programs. One possibility would be to send a few people to Montpelier during the design/build phase for three or four days of training in HACCP/SSOP, meat cutting and sausage making. NECI also has expertise in developing follow-up training programs to use once the facility is operating. The cost of any particular program depends on its design and is negotiated case-by-case. A basic 3- or 4-day program in Montpelier for a few people would cost somewhere in the low thousands.

Koch Equipment's processing division (in Kansas City, MO) offers several 3-day seminars a year on making about 14 products including sausage. The cost is $1,250 for the first person and $900 for each additional person, including hotel and meals but not including travel. For each $10,000 in processing equipment purchased, the customer can get one free tuition. (Packaging equipment, etc., doesn't count towards the total.)

HACCP training is not widely available but there are options. With HACCP becoming more widely known and enforced it is expected that opportunities will become more abundant in the future. For example, in mid-2001 the Massachusetts Farm Bureau offered one-day Food Manager (HACCP) seminars in several Massachusetts locations at a cost of $115 per person. The Food Processing Center in Greenfield also expects to offer food safety training seminars in the near future, though details are not yet available.

Vocational schools and community colleges also offer numerous educational possibilities for various aspects of food preparation.

PLANT AND EQUIPMENT

The facility's building and equipment will require specialized design. Regulations and common sense dictate that sanitation is a major consideration for both building and equipment. In addition, the process requires specialized equipment with capacities large enough for the anticipated volume and balanced to each other's outputs.

Building requirements

Federal inspection requires that the building meet several standards, as set out in 9 CFR 416.2, "Establishment grounds and facilities":

- Ground conditions must not lead to insanitary conditions, adulteration, or interference with inspection;
- Pest management program;
- Sound construction, in good repair, sufficient size;
- Walls, floors and ceilings impervious to moisture and cleanable;
- Prevent entrance of vermin;
- Edible/non-edible kept in separate rooms to extent necessary to prevent adulteration or insanitary conditions;
- Good lighting in food, equipment, cleaning and toilet/locker areas;
- Good ventilation;
- Water supply and sewage disposal (detailed requirements);
- Floor drainage;
- Sufficient dressing rooms, lavatories, and toilets; soap and water;
- Sufficient refuse receptacles.

The text of 9 CFR 416.2 appears in **Appendix E**.

Total size is a function of the space needed for work area including machinery and furnishings plus refrigeration plus washrooms plus office space plus halls & loading areas, etc. The proposed facility will probably be in the range of 1,600 to 2,000 square feet. Different types of space will require different degrees of finish. A possible breakdown of 2,000 square feet, disregarding dry storage and walkways, might be:

- Active work space (finished to sanitary standards), 720 sf
- Locker and lavatory (also highly finished), 200 sf
- Offices (basic finish), 160 sf
- Retail area (basic finish), 320 sf
- Refrigerated space (no finish required), 600 sf

The equipment will require a lot of electricity. As specified in the section below, the various units' needs are as follows:

- The KF-50 stuffer (1.2 hp) needs 208v/60H/3phase or 220v/60H/singlephase; amperage requirement is unclear: one model apparently needs 4 amps, the other one 8 amps.
- The 700S Mixer/grinder (2+7 hp) needs 220v/60H/3phase, 28 amps.
- The Ultravac 2100 (5 hp) 208, 230 or 460 volts/60H/3 phase, 10 to 13 amps.
- For refrigeration, three-phase 208 or 230 is best for most compressors; a 2 hp compressor needs a 20-amp circuit.

Refrigeration

The facility will need a walk-in cooler for storing incoming hanging carcasses and a walk-in freezer for storing finished inventory and for flash-freezing sausage prior to vacuum packaging. It will also be useful to have a reach-in cooler in the work area for marinating kebabs and other purposes. The retail area will need a glass-door reach-in freezer and will probably also need a deli case and a glass-top chest freezer (as used for displaying ice cream novelties).

The walk-in cooler will need a rail system to handle large numbers of carcasses. According to the specialist at Koch Supplies, each system needs to be custom-designed to the cooler. One key question is whether the rails will hang structurally from the building frame (through the roof of the cooler) or will need to have a steel support system built inside. The necessary strength of an internal steel frame depends on how long the spans are and the weight per

carcass. It requires design by structural engineer. The location of the compressors and blowers and the height of the ceiling are also important. Coolers with rail systems are generally large, at least 20'x20'.

The capacity of a rail system is basically limited by the length of storage rail (not counting the turnarounds). For lambs in a holding cooler, one foot per carcass or nine inches per half-carcass should suffice. Rails should be bare minimum of 17" apart. A range of 24"-30" is more standard. Thirty inches is best, especially if there is a possibility of adding beef in the future, since beef carcasses require 30". In a chilling cooler (to take the heat out of freshly-killed animals) more space is needed between carcasses. As shown in the calculation below, a 10'x20' cooler with rails on 30" centers would provide approximately 60 linear feet. On 24" centers, there would be 75 linear feet. Therefore a 10'x20' cooler could accommodate 75 lamb carcasses, barely, with no potential for beef. A 20'x20' with rails on 30" centers could handle up to 120 lamb carcasses or 160 half carcasses, and would also have potential for beef.

Cooler dimensions	Space between rails	Number of rails	Storage length per rail	Linear feet of storage rail
10x20	24 inches	5	15 feet	75 feet
10x20	30 inches	4	15 feet	60 feet
20x20	24 inches	10	15 feet	150 feet
20x20	30 inches	8	15 feet	120 feet

Assuming 100 lambs per week, a typical storage period of 2 to 4 days, and a 5-day work week, the cooler needs to routinely accommodate between 40 and 80 carcasses. There will be times when more storage is required due to more-frequent or larger-than-usual deliveries. There is a big spike in demand every year around Easter.

The amount of freezer space is dictated by the space required to store work-in-process (items chilling before vacuum-wrapping) and finished goods. Crudely assuming that each 10-pound box of sausage is one cubic foot, a 500-pound batch of sausage will require 50 cubic feet, or 10 feet of floor space stacked five feet high. A freezer box 10 feet by 10 feet would provide a little less than 100 square feet of floor space, which, assuming good shelving design and good inventory management, seems adequate to allow for additional finished goods and work-in-process. It would probably be prudent to make arrangements with other food businesses to use their freezers in an emergency.

Processing and other equipment

The following items of equipment will meet the facility's processing needs as discussed above. All are available from Koch Equipment in Kansas City, MO.

The Koch 700S grinder/mixer has a hopper capacity of 200 pounds. Grinding capacity is up to 55 pounds a minute so this will not be a bottleneck in the process.

The Koch KF-50 piston sausage stuffer has a piston capacity of 50 pounds[9]. Its operating capacity is 100 to 150 pounds per hour depending on how fast the operator wants it to go – it has variable controls. A 500-pound batch of sausage would require between 3½ and 5 hours.

For small batches, a tabletop electric grinder has a capacity of 3 to 4 pounds per minute and a hand-cranked tabletop piston stuffer has a piston with a 12-pound capacity.

The Koch Ultravac 2100 vacuum packager has dual chambers that each can hold up to eight six-inch packages. With the 5-hp pump and "pre-cut" sealing option, each cycle takes about 45 seconds per chamber, so 3 minutes = 2 full cycles = 32 packages = 25 pounds. Five hundred pounds could be packaged in 60 minutes, assuming maximum output.

A dishwashing machine may not be strictly necessary, since items can be washed by hand, but would be very useful and is recommended. In addition, there will be need for a large number of small items such as shelving, tables, rolling racks, carts, sanitation and maintenance equipment, etc. It would be useful and prudent to include a ladder,

[9] Water weight; actual meat weight would be slightly less depending upon density.

ramp or steps for filling the sausage stuffer (43 inches high) and the mixer/grinder (57 inches).

FINANCIAL PROJECTIONS

Preliminary calculations show that total investment to start up the proposed project and cover one year of overhead is about $340,000. Most of this is for the building, which must meet high standards of sanitation and requires good utilities. Another large item is equipment, mostly for new processing equipment and good used refrigeration. The balance consists of miscellaneous start-up costs and a year of operating overhead. The following chart summarizes the first year's costs and resulting balance sheet, assuming a $350,000 initial investment, no debt, no revenue and no variable costs.

Summary of first year's financial results		
Expenses		
Start-up costs		(17,700)
Operating overhead		(37,855)
Interest		0
Income tax		11,639
Net income		(43,916)
Uses of cash		
Building		(207,800)
Equipment		(97,200)
Loan repayments		0
Operating cash flows		(36,341)
Total		(341,341)
Balance sheet after 12 months:		
Cash		8,659
Plant & equipment - cost	305,000	
accumulated depreciation	(19,214)	
Net fixed assets	285,786	285,786
Total assets		294,445
Income tax due (credit)	(11,639)	
Current portion of long-term debt	-	
Long-term debt	-	
Total liabilities	(11,639)	(11,639)
Owner's original equity	350,000	
Retained earnings	(43,916)	
Net equity	306,084	306,084
Total liabilities & equity		294,445

Realistically, most of the building and equipment cost could be borrowed. Assuming that 80% of both can be financed with debt at 8%, the amount of original owner's capital can be reduced to $150,000, with the following results:

Summary of first year's financial results		
Expenses		
Start-up costs		(17,700)
Operating overhead		(37,855)
Interest		(18,645)
Income tax		15,545
Net income		(58,655)
Uses of cash		
Building		(207,800)
Equipment		(97,200)
Loan repayments		(23,864)
Operating cash flows		(54,986)
Total		(383,850)
Balance sheet after 12 months:		
Cash		10,150
Plant & equipment - cost	305,000	
accumulated depreciation	(19,214)	
Net fixed assets	285,786	285,786
Total assets		295,936
Income tax due (credit)	(15,545)	
Current portion of long-term debt	23,864	
Long-term debt	196,272	
Total liabilities	204,591	204,591
Owner's original equity	150,000	
Retained earnings	(58,655)	
Net equity	91,345	91,345
Total liabilities & equity		295,936

Since this project is still in the very early feasibility stages, all of the estimates contained in this report are approximations based on one or two contacts with knowledgeable people. In some cases – particularly on new equipment – it was possible to obtain a firm quote on a particular item, although the quotes are only good for limited times. In others – especially building costs – it is only possible to give a rough indicator of likely costs, with exact amounts highly dependent on details too numerous to predict. There are numerous suppliers of all services and every situation is different. The electronic spreadsheets submitted with this report are designed to allow the projections to be re-calculated based on changing assumptions.[10]

The financial projections (income statement, statement of cash flows, and balance sheet), with no consideration of revenue or direct costs, are presented in **Appendix A** based on an all-equity investment model.

Capital Expenses

Capital expenses include plant and most equipment and are estimated to total $305,000. Inexpensive miscellaneous equipment is included in the "start-up costs" section.

Capital expenses all appear on the spreadsheets in the final month before opening. Obviously, expenditures would in reality occur over several months before opening. Similarly, building loans are assumed (artificially) to be received in the final month in lump sum. Equipment would probably actually arrive in that month, as would any equipment loans.

[10] Numbers displayed electronically in red represent assumptions and can be altered directly by the user; numbers displayed in black are calculated by the software.

Building

Based on the considerations discussed below, subject to much revision as the project develops, the total estimated cost for the building is $207,800, *not including land*.

This report assumes that it will be necessary to build new. The facility must not only have the right size, layout and accessibility but must also meet Federal sanitation standards including floor drains and completely washable floors, walls and ceilings (tile or stainless steel, for example). It is conceivable that such space might be available to rent or renovate, but such opportunities are likely to be scarce.

One obvious possible location to rent space is the Western Massachusetts Food Processing Center currently about to open in Greenfield. However, as of Summer 2001, the center does not plan to offer the USDA inspection needed for meat.

The figures presented in this report are based on conversations with people at two local firms. Mowry and Schmidt, a Greenfield firm, was general contractor for the Food Processing Center and for an addition to Pekarski's sausage in Conway. The Dennis Group in Springfield specializes in designing and building food processing plants, especially pasta, soup, meat, beverages and packaged salad. These estimates are intended only as a very rough guide to be further refined as different construction, renovation or rental options are explored. Renovation costs could vary greatly depending upon the site under consideration and would need particularly careful case-by-case evaluation.

The two Mowry & Schmidt projects are both somewhat larger than the proposed facility. The Pekarski project, a concrete-block addition for retail space, was about $50 per square foot. The Greenfield food processing center is finished to very high standards and cost about $200 per square foot, not including equipment or refrigeration. Based on these projects, a general estimate of $100 to $125 per square foot seems like a reasonable target range for the facility under consideration.

Tom Dennis at the Dennis Group says that a USDA-quality facility, free-standing, usually costs about $125 to $150 per square foot, including refrigeration but not including site costs. He estimates that developing an acre site usually costs about $100,000. He recommends that consideration be given to renovating an existing facility, where the envelope of the inspected area would have a finish cost in the range of $50 to $75 per square foot.

These rough estimates are consistent with the findings of the 1999 Hudson Valley Meat Processing Facility Feasibility Study, which estimates that a 5,000-square-foot combined slaughterhouse and processing facility with no retail area could be built for $75 per square foot. The projected volume was 2,000 cattle and 2,200 hogs plus additional other species per year. The study estimates the slaughterhouse alone at $330,000 and the combined facility at $605,000, for a net additional cost of $275,000 for the processing facility.

The projections in this report use the following assumptions:

- Semi-fixed costs such as design, permitting, project management, site work, utility connections, plumbing, HVAC, etc. total $50,000.
- The building shell and floor will cost $50 per square foot.
- Finishing the work space and locker room/lavatory will cost $55 per square foot.
- Finishing the office and retail space will cost $15 per square foot.

Investment in the building is summarized below.

Building Costs	
Item	Amount
Fixed costs - site, design, permits, utilities, HVAC, etc.	*$ 50,000*
Finished work space	
Work room - sf	720
Lavatory & locker space - sf	200
Total work space	920
Ave. finish cost psf	$ 55
Subtotal finished space	*$ 50,600*
Finished office/retail space	
Retail space - sf	320
Office space - sf	160
Total office & retail space	480
Ave. finish cost psf	$ 15
Subtotal office/retail space	*$ 7,200*
Refrigerated space - sf	600
Total sf	2,000
Shell & floor cost psf	$ 50
Subtotal shell & floor cost	*$ 100,000*
Total	*$ 207,800*

Refrigeration

The total cost of refrigeration is estimated at $50,000 including installation.

It is recommended that the walk-in refrigeration be purchased new, as it is not significantly cheaper to buy used. It is also easier to install a rail system in a new cooler especially designed for the purpose. For the reach-ins and deli cases, etc., used equipment is less expensive and readily available.

The cost of new refrigeration is based on a conversation with Arctic Refrigeration in Greenfield. The cost of used refrigeration is based on a visit to Northern Closures in Westfield, a company that removes equipment from supermarkets undergoing renovation or demolition. In many cases, supermarket chains renovate every three or four years and the equipment is therefore is not only of top quality originally but often in nearly new condition.

A new 20’ x 20’ walk-in cooler would cost around $5,000 to $8,000, including compressors, installed. It is preferable to have a “low-velocity” coil system because there is less air movement and the meat dries out less. This would cost an additional $2,000 to $2,500. The projections assume a total cost of $9,000, with an additional $2,000 (on the high side) for the electrical work.

A new 10’ x 10’ freezer with a heated door would cost between $4,500 and $7,000. The projections assume a cost of $6,000 plus $1,000 for electrical work.

A used deli case for the retail area would cost about $2,500 installed, and a reach-in cooler and freezer with glass doors would be about $1,500 and $2,500 respectively. An ice-cream novelty freezer chest is about $500 used.

Refrigeration rail systems are seldom available as used equipment. As stated above, the cost of a new rail system built on an internal steel frame depends on how long the spans are and the weight per carcass and must be designed by a structural engineer. The frame is pre-fabricated; installation is arranged by the customer but is relatively

simple. The rails and gambrels themselves are a third of the cost or less; the steel and engineering in the support system are the expensive part.

Koch Equipment recently did a 15'x24' cooler for beef quarters (which weigh typically 200 pounds or so) and it cost between $20,000 and $30,000. At roughly a third of the total cost, the rail system alone was about $7,000 to $10,000. Assuming a total of 120 linear feet[11], the cost for the rail system, without support or installation, was therefore about $60 to $80 per linear foot of storage. Assuming that it is desirable to retain the option of processing beef, the projections assume that the cost of a rail system will be $25,000; it should be possible to lower this cost if the rail is suspended from the building frame rather than from an internal steel frame. It is assumed that installation will be an additional $2,000.

Refrigeration investment is summarized below.

Refrigeration		
Item		Amount
Equipment, delivered		
Walk-in freezer	$	6,000
Walk-in cooler	$	9,000
Rails for walk-in cooler	$	25,000
Reach-in cooler	$	1,500
Deli case	$	2,000
Reach-in freezer	$	2,000
Total	$	45,500
Equipment installation		
Walk-in freezer	$	1,000
Walk-in cooler	$	2,000
Rails for walk-in cooler	$	2,000
Reach-in cooler	$	-
Deli case	$	500
Reach-in freezer	$	-
Total	$	5,500
Installed horsepower		
Walk-in freezer		2.00
Walk-in cooler		2.00
Reach-in cooler		0.75
Deli case		0.75
Reach-in freezer		1.00
Total		6.50

Processing and other equipment

It is estimated that processing and other equipment will cost $47,200.

It is recommended that processing equipment be purchased new rather than used. New equipment will be very easy to clean and use, will be under warranty with simple installation and available parts, and will comply with current sanitary standards. In addition, while meat processing equipment is available on the used market, it is not common, and it may be difficult to locate the right mix of pieces. Pieces of new equipment can be selected to match each other's capacity, optimizing workflow.

Other equipment can be purchased used and in many cases it is significantly cheaper to do so.

[11] Six rails on 30" centers, each with 20 feet of storage

The equipment from Koch Equipment described above is currently available at the following prices:

- Koch 700S grinder/mixer: $9,995 plus $369 for set of additional cutting tools, plus shipping from KC, MO (523 pounds uncrated, 583 pounds crated, est. cost $563) Total $9,995 + 369 + 563 = $10,927
- Koch KF-50 piston sausage stuffer: $4,995 plus $749 for the special table, plus shipping from KC, MO (crated: 20 cu. ft, 320 pounds according to catalog; according to e-mail from Dave Schmid, 440 pounds, cost $482). Total $4,995 + 749 + 482 = $6,226.
- The tabletop electric grinder (Koch number022702) costs $595 plus $8.25 each for stuffing tubes; with allowance for shipping, the total with two tubes would be about $650.
- The tabletop piston stuffer costs $525; with allowance for shipping, the total would be about $550.
- Koch Ultravac 2100 vacuum packager: $10,995 with 5 hp pump plus $3,500 for optional washdown system, plus $1,500 for the "pre-cut" option, plus shipping from KC, MO (shipping weight about 1,200 pounds; est. cost $700). Total $10,995 + 3,500 +1,500 + 700 = $16,700.

Used dishwashers are spottily available and run anywhere from $1,000 up, depending on a number of factors. According to a salesperson at Holyoke Equipment Company, an under-counter commercial dishwasher would cost about $3,700 new. The projections assume a cost of $3,700.

For miscellaneous equipment such as shelving, carts, tables, rolling racks, etc., the projections assume an allowance of $5,000.

Equipment investment is summarized below.

Equipment Costs

Item		Amount
Equipment, delivered		
Grinder/mixer	$	10,900
Sausage stuffer	$	6,200
Vacuum-wrap machine	$	16,700
Small grinder and stuffer	$	1,200
Processing equipment subtotal	*$*	*35,000*
Refrigeration	$	45,500
Dishwasher	$	3,700
Sink	$	600
Shelves, tables, racks, carts, ramps	$	5,000
Total	$	89,800
Equipment installation		
Grinder/mixer	$	250
Sausage stuffer	$	250
Vacuum-wrap machine	$	500
Small grinder and stuffer	$	-
Refrigeration	$	5,500
Dishwasher	$	500
Sink	$	400
Shelves, tables, racks, carts, ramps	$	-
Total	$	7,400
Total cost, delivered and installed	$	97,200

Start-up Expenses

Start-up expenses have been put into the projections all at once at the beginning. Obviously, in reality the costs

would be incurred over several months leading up to the opening.

These costs include one-time expenses that are not capitalized, amounting to $17,700 as shown below. A total of $9,000 is allowed for recruitment, training and HACCP/SSOP development; these costs overlap to some degree.

Start-up costs

Item	Amount
Management overhead*	3,000
Recruitment	1,000
Training	5,000
HACCP plan, SSOP development	3,000
Other prof. services (legal, acctg.)	2,500
New labels set-up	200
Miscellaneous small equipment	3,000
Total	$ 17,700

*Not including building-project management

Miscellaneous small equipment would include such things as bowls and containers, knives and other tools, sanitation and maintenance equipment, etc.

Start-up costs do *not* include original stock, which is a pre-paid variable expense. This would include sausage casings, plastic and paper wrapping material, vacuum pouches, etc. An initial stock of each would add up to less than $500. The expensive single items would be sausage casings, at around $200 per 2,700' "caddie", and vacuum pouches at about $60 for a single case of 1,000. Plastic bags, wrapping materials, tape, etc. cost very little. Labels, spices and boxes are usually arranged and paid for separately by the customer.

Operating Expenses

Operating expenses after the startup quarter are projected at between $9,000 and $10,000 per quarter, depending mostly on energy costs. The total projected for the first year is $38,000, about half of it depreciation.

The largest cash operating expenses will be energy (about $7,700 per year), property tax on the building ($5,200) and property insurance ($2,100). The minimal amount of management overhead required (assuming no production) is the opportunity cost of the manager's time rather than an additional cash expense. This is estimated at a minimal $200 per month after the first three start-up months. Depreciation on plant and equipment is a non-cash expense totaling $19,200 in the first year.

Energy expense will fluctuate seasonally, with extra summer refrigeration costs somewhat offset by lower lighting costs. The estimate for refrigeration electricity included in the projections (kilowatt-hours per compressor horsepower, by month) is based on a conversation with Gary Schaefer, owner of Snow's Ice Cream. Overall electric needs (mainly for lighting) are estimated based on a conversation with Ed Maltby. Temperature-control costs have also been estimated based on conversations. Since the working areas of the building will be temperature-controlled year-round, it is assumed that winter heating costs will be approximately equal to summer cooling costs. These are obviously very rough estimates. More precise estimates would depend on the exact equipment purchased and the exact energy consumption characteristics of the building.

It is assumed that property tax will be assessed at 2.5% of building cost. The tax rate varies from town to town and in some cases farm buildings are eligible for generous exemptions from property tax. There is therefore a good possibility that the actual property tax obligation will be lower than the projected amount.

Plant and equipment depreciation are large non-cash expenses. Based upon a conversation with accountant Joe Wolkowicz, it is assumed that the building will be depreciated over 39 years and the equipment over 7 years. For simplicity, the models assume straight-line depreciation.

Taxes

Depending on the exact tax status of the entity owning the project, income tax rates can range from zero percent[12] to 42%.[13] The projections assume corporate taxes at the lowest Federal rate (15%) plus Massachusetts taxes for a total of 21.95%. Based on this assumption, and bearing in mind that the model presented here is limited to operating overhead costs, the model projects an income tax credit of about $2,000 per quarter.

Revenue considerations

Revenue projections are beyond the scope of this report. However, some basic calculations can help determine whether the proposed facility's economic usefulness justifies the expected investment and operating overhead.[14]

Three useful calculations can be made based on the cost of outsourcing. It is possible to compare:

- in-house direct costs to outsourced costs for sausage production;
- in-house to outsourced vacuum-packaging; and
- the total annual outsourced processing cost to industry financial ratios for revenue, operating expenses and fixed assets.

The sample calculation below estimates direct costs of sausage-making at 18 cents per package less than outsourcing, not including electricity and equipment maintenance.

Direct cost of sausage		
Item		Amount
Labor per package	$	0.55
Materials per package:		
Casings	$	0.12
Plastic wrap	$	0.01
Vacuum pouch	$	0.06
Total direct costs per package	$	0.74
Outsourced processing cost per package	$	0.92
In-house cost advantage/(disadvantage) per package	$	0.18
Assumptions:		
Sausage batch size (pounds)		500
Package size (pounds)		0.80
Work hours to process sausage batch		24
Hourly wage rate	$	12.00
Benefits & payroll taxes surcharge		20%
Cost of casings (caddie)	$	190.00
Inches per caddie		32,400
Inches of casings per pound		25
Cost of case of vacuum pouches	$	55.00
Pouches per case		1,000
Outsourced processing cost per pound	$	1.15

Customers generally provide spices, labels and boxes at their own expense, as well as the trim for which they have already paid to have cut from the carcass.

The calculation below estimates the direct cost of vacuum packaging will be 21 cents per 8/10 pound package, or 29 cents per one-pound package, below the outsourced price. Therefore, the entire projected cost advantage for in-house sausage processing (and a little more besides) comes from vacuum packaging.

[12] Assuming a partnership where all profit and loss flows through to the partners.
[13] Highest Federal corporate rate of 35% plus 5.95% Massachusetts corporate rate.
[14] In addition to the easily quantifiable costs, outsourcing has a hidden cost. If the processing schedule is inflexible, certain cuts (shoulders, legs, shanks) may end up being used as trim even though they could otherwise be sold at higher prices.

Direct cost of vacuum packaging	
Item	Amount
Labor per package	$ 0.05
Materials per package:	
Plastic wrap	$ 0.01
Vacuum pouch	$ 0.06
Total direct costs per package*	$ 0.11
Outsourced cost per pound	$ 0.40
In-house cost advantage/(disadvantage):	
per .8-pound package	$ 0.21
per one-pound package	$ 0.29
Assumptions:	
Packages per machine hour	600
Workers needed to feed machine	2
Hourly wage rate	$ 12.00
Benefits & payroll taxes surcharge	20%
Cost of case of vacuum pouches	$ 55.00
Pouches per case	1,000

Assuming overhead operating costs of $38,000 per year, if the 29 cents per pound cost advantage from vacuum packaging were the only economic justification for the project, it would be necessary to vacuum package 130,000 pounds of lamb per year to cover overhead. Assuming 5,000 lambs per year, that would be an average of 26 pounds per carcass. The current average (see chart below) is 14 pounds per carcass, for a projected 70,000 pounds per year.

Based on current outsourced prices, it costs up to $41 to process a lamb, not including slaughter:

Itemized costs of outsourced services							
Item	Boning	Cutting	Sausage making	Vacuum packing	Charge per unit	Units per lamb	Amount per lamb
Boned legs & shoulders (ea.)	$ 1.50				$ 1.50	4	$ 6.00
Meat for fresh sale (lbs.)		$ 0.40			$ 0.40	43	$ 17.20
Meat for frozen sale (lbs.)		$ 0.40		$ 0.40	$ 0.80	5	$ 4.00
Sausage (lbs.)		$ 0.40	$ 0.75	$ 0.40	$ 1.55	9	$ 13.95
Total pounds						57	
Total cost							$ 41.15

The matrix below shows the total annual processing costs at volumes from 500 to 5,000 lambs per year, with costs per lamb ranging from 50% to 200% of the current cost:

Total annual outsourced processing costs at various rates & production levels							
	Processing cost per lamb						
Lambs per year	$ 20.58	$ 30.86	$ 41.15	$ 51.44	$ 61.73	$ 72.01	$ 82.30
500	10,288	15,431	20,575	25,719	30,863	36,006	41,150
1,000	20,575	30,863	**41,150**	51,438	61,725	72,013	82,300
1,500	30,863	46,294	61,725	77,156	92,588	108,019	123,450
2,000	41,150	61,725	82,300	102,875	123,450	144,025	164,600
2,500	51,438	77,156	102,875	128,594	154,313	180,031	205,750
3,000	61,725	92,588	123,450	154,313	185,175	216,038	246,900
3,500	72,013	108,019	144,025	180,031	216,038	252,044	288,050
4,000	82,300	123,450	164,600	205,750	246,900	288,050	329,200
4,500	92,588	138,881	185,175	231,469	277,763	324,056	370,350
5,000	102,875	154,313	205,750	257,188	308,625	360,063	411,500

At the current costs and the current volume of 1,000 lambs per year, total non-slaughter processing cost amounts to approximately $41,150 (highlighted).

This processing cost would be saved if the proposed facility were in operation. The amount saved would be the amount of revenue. This information combines with projected investment and operating expenses to generate some crude financial ratios.

Selected financial ratios				
	Cost per lamb: current		Cost per lamb: 25% higher	
	$ 41.15	$ 41.15	$ 51.44	$ 51.44
Lambs per year	1,000	5,000	1,000	5,000
Annual "revenue"	$ 41,150	$ 205,750	$ 51,438	$ 257,188
Operating expenses	$ 37,855	$ 37,855	$ 37,855	$ 37,855
as % of revenue	*92%*	*18%*	*74%*	*15%*
Net fixed assets	$ 285,786	$ 285,786	$ 285,786	$ 285,786
as % of revenue	*694%*	*139%*	*556%*	*111%*
Depreciation	$ 19,214	$ 19,214	$ 19,214	$ 19,214
as % of revenue	*47%*	*9%*	*37%*	*7%*
as % of net fixed assets	*7%*	*7%*	*7%*	*7%*

Comparing financial rations for the meat-processing industry provided by standard reference works[15] with the projections above provides a very rough benchmark of the appropriateness of the proposed investment and operating overhead costs given expected volume. This ratio comparison is extremely crude and should be interpreted cautiously. Among other things, the average enterprise in the industry benchmark has about one hundred times the expected revenue of the proposed facility.

Meat-processing industry financial ratios			
	Troy: All (1,809 firms)	Troy:$100-250K assets (370 firms)	RMA: All 1996-97 (86 firms)
Average sales ($000)	33,830	1,374	100,815
Operating expenses (% of revenue)	na	na	13.3%
Net fixed assets (% of revenue)	11.3%	4.4%	8.0%
Depreciation (% of revenue)	1.2%	1.0%	na
Depreciation (% of net fixed assets)	10.6%	22.9%	na

This comparison shows that, assuming volume of 5,000 lambs a year, at current outsourced prices or a little higher, the facility has operating expenses of 15% to 18% of revenue, similar to the 13.3% share at very large processors. However, investment in fixed assets is much higher for the proposed facility than for the industry as a whole. Fixed assets are projected to exceed 100% of sales revenue, compared to an industry range of 4% to 12%. This could be partly explained if most larger companies are working with fully-depreciated plant and equipment.[16] Overall, this comparison shows that we are close to a viable model for the proposed facility, but that it might be possible and would certainly be desirable to reduce investment in fixed assets. The most likely places to find savings are in the building cost and in costs for the cooler rail system.

[15]Leo Troy, *Almanac of Business and Industrial Financial Ratios 1998* (Prentice Hall) and RMA, *Annual Statement Studies 1997*.

[16] Note that industry comparables have higher depreciation as a percent of net fixed assets. This would be consistent with fixed assets that consisted of old buildings and equipment supplemented by occasional purchases of new equipment.

APPENDICES

Appendix A - Financial projections
Appendix B – Application form for FSIS grant of inspection; text of 9 CFR 500
Appendix C – HACCP information in companion volume
Appendix D – Sample process diagram and HACCP plan draft
Appendix E – Sanitary SOP regulations
Appendix F – Lockout/tagout agreement draft
Appendix G – Good Manufacturing Practices regulations

Appendix A - Financial projections

1. Income Statement
2. Statement of Cash Flows
3. Balance Sheet

Appendix B – Application form for FSIS grant of inspection; text of 9 CFR 500

Appendix C – HACCP information in companion volume

1. Generic HACCP model for raw, ground meat and poultry products

USDA FSIS, September 1999, HACCP-3 (printed from www.fsis.usda.gov 7/6/01)

2. List of HACCP documents available from FSIS: guidebook and generic plans

Printed from www.fsis.usda.gov 7/6/01

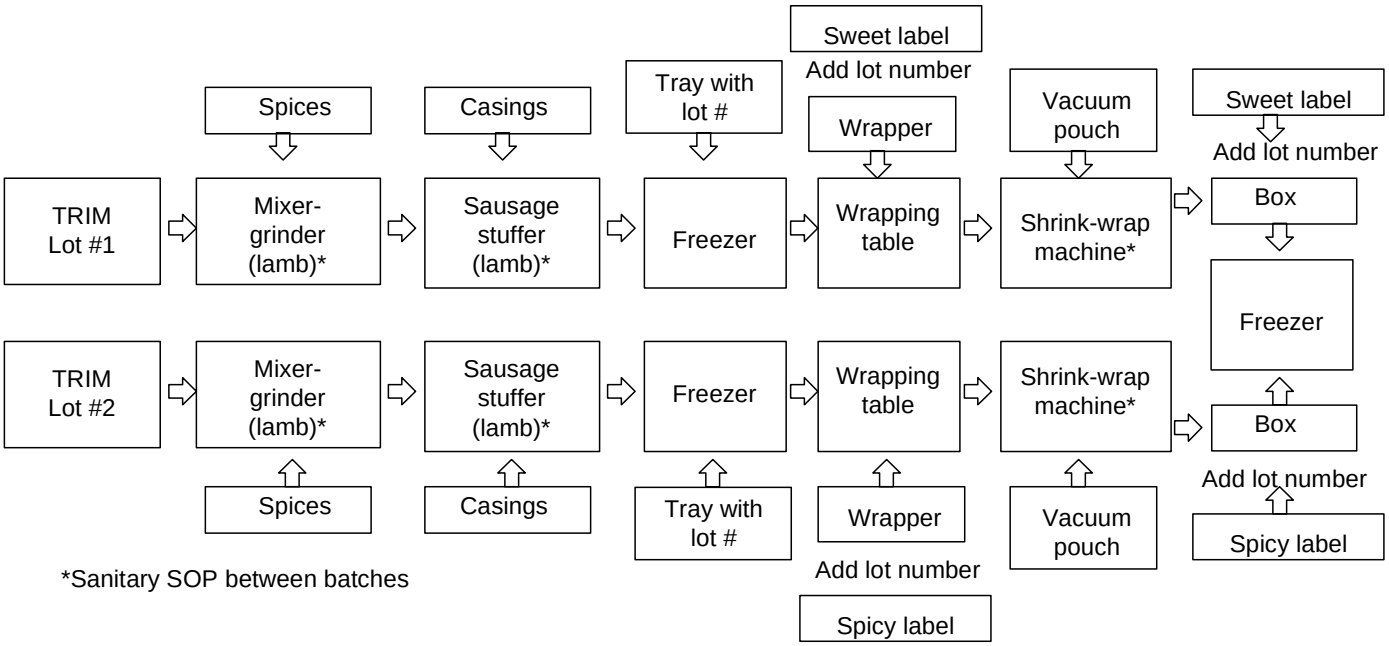
3. Text of HACCP Federal regulation 9 CFR 417, July 25, 1996

Albany FSIS office, mailed with application materials for grant of inspection, June 2001; source "Federal Register Online via GPO Access [wais.access.gpo.gov]"

4. Hazard Analysis and Critical Control Point Principles and Application Guidelines

Adopted August 14, 1997, National Advisory Committee on Microbiological Criteria for Foods; copied from *Journal of Food Protection*, September 1998

Appendix D – Sample process diagram and HACCP plan draft



Based on the generic plan for "Raw, Ground Meat and Poultry Products" available through the FSIS website, hazards include:

- presence of Salmonella on incoming meat products;
- pathogen growth at the location where meat was stored;
- metal shavings contamination at grinding; and
- metal shavings contamination carried through into packaged product.

In addition, it seems reasonable to include contamination from dirt, insects, etc.

Controls might include:

- obtain meat only from USDA certified slaughterhouses;
- keep the meat chilled below 40F until it is ground;
- freeze the sausage immediately after stuffing;
- keep the freezer below 10F;
- visually inspect grinders at each cleaning for any damage, and/or run the packages through a metal detector; and
- implement the Sanitary SOP.

Each of these controls would be monitored and recorded, with times. For example:

- temperatures in the truck and in the holding cooler;
- elapsed time between removing each lot for grinding and putting it in the freezer;
- temperature in the freezer;
- times of inspecting grinders and damage notes;
- daily SSOP carried out.

Appendix E – Sanitary regulations (9 CFR 416.1-6, 416.11-17))

Appendix F – Lockout/tagout agreement draft

COOPERATIVE AGREEMENT FOR LOCKOUT/TAGOUT PROCEDURES
BETWEEN FSIS AND BRAMBLE HILL FARM

Lockout/tagout procedures for the Food Safety and Inspection Service and Bramble Hill Farm, Establishment No. _____, located at 593 South Pleasant Street, Amherst, Massachusetts.

In order to facilitate sanitation, maintenance and inspection of equipment while avoiding injury, the FSIS and Bramble Hill Farm agree that all power equipment subject to inspection will be cord-and-plug electrical equipment. Hazard of injury will be controlled by unplugging the equipment from the energy source before the equipment is cleaned, maintained or inspected. The plug will be under the exclusive control of the employee performing the cleaning or maintenance. During FSIS inspection, the equipment and its plug will be under the exclusive control of the FSIS inspector. All employees authorized to clean or maintain the equipment will be trained to unplug the equipment before servicing.

During inspection or verification of corrective action, the inspector shall
1. Inform establishment management to unplug electric equipment as needed. The operator will place the disconnected plug where it can be readily seen by the inspector during the inspection.
2. After unplugging, inform operator to try push button or normal operating controls to make certain the equipment has dissipated stored energy. The operator will then return the controls to the "off" position.
3. Inform management when the inspection is complete and return control to the operator.

	Bramble Hill Farm	**FSIS**
Signature	_____	_____
Printed Name	_____	_____
Title	_____	_____
Date	_____	_____

Appendix G – Good Manufacturing Practices regulations